Chapter 2.

HAPPY, Heart Attack Prevention Program for You

Adapted from:
Mass Screening and Intervention by Mass Communication: The HAPPY Program

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Abstract

Background
Myocardial infarction is still a major cause of death in global society. A simple, fast, low cost and robust screening tool to identify the patient at risk is lacking.

Objectives
Identify patients vulnerable to myocardial infarction.

Methods
Volunteers register on a website and are scheduled for “health carousel” consisting of different stations where the biometrics to calculate the PROCAM score were collected and blood was taken. This at a rate of 250 participants per hour. All participants received their PROCAM scores and personalized lifestyle coaching using e-mails during 3 months. Subsequently the participants are invited for the second health carousel to measure the effect of the intervention. After 10 years, the risk calculations were evaluated using an internet-based questionnaire.

Results
900 participants took part in the first tests and 595 of these participants took part in the second test after intervention. The Procam score in the group of these 595 participants, decreased from 6.3% to 5.5% (P= .000), 50% of the participants suffered from hypertension (systolic >140 and/or diastolic >90), which decreased to 30% after intervention. LDL decreased from 140 mg/dL to 136 mg/dL.

Conclusions
Low cost mass-screening by the use of the internet is possible. The Procam score shows robust predictions for 10-year risk of myocardial infarction in a real world evaluation in a 2007 cohort.
Introduction

Cardiovascular diseases remain a major cause of morbidity and mortality, both in the Western world and developing countries. It is expected that these numbers will continue to increase in the coming decades due to escalating proportions of obesity and the aging population. The magnitude of this health care problem calls for innovative measures to improve cardiovascular health at population level. It is known that 90% of cardiovascular diseases are related to an unhealthy lifestyle. Several risk factors, such as overweight, smoking and hypercholesterolemia, are modifiable by intervention and reduce cardiovascular risk. That is why we initiated a HAPPY-Globally (HAPPY= Heart Attack Prevention Program for You) program, with the objective of mass screening for the likelihood of adverse cardiovascular events, mass communication for educating the community for prevention of cardiovascular disease and recommendation of therapeutic intervention wherever appropriate. We started with a community model within the city of Maastricht, the Netherlands. Mass screening was undertaken in an unselected population of 1000 volunteers invited to participate in HAPPY-Maastricht through advertisements in newspapers. The 10-year risk to develop myocardial infarction was computed according to the Prospective Cardiovascular Munster Study (PROCAM) risk score. The screening carousel allowed for risk assessment in 250 participants every hour. All participants received a monthly e-mail newsletter containing healthy lifestyle advice and were offered to participate in walking and running clinics for a period of 3 months on a voluntary basis. We evaluated whether mass screening and mass communication concerning lifestyle would offer an effective tool to improve cardiovascular health at a population level.

Methods

Participants. Volunteers were recruited through health-related pieces published in local newspapers including invitation to participate; the volunteers registered to the HAPPY program through an internet website in March 2007. Entrance into the study was confirmed after completion of a questionnaire based on the PROCAM risk score. The total number of participants was initially restricted to 1000.

Mass screening of cardiovascular risk. For this purpose, we organized a cardiovascular health fair in the University Hospital Maastricht. The health
fair comprised multiple stations, which allowed for the evaluation of 250 participants per hour. The study was approved by the Institutional Review Board, and written informed consent was obtained from all participants prior to their joining the study. We assessed the cardiovascular risk score by the PROCAM based questionnaire and blood pressure (BP), total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides (TG) and glucose levels. Blood samples were obtained after an at least 10-hour overnight fast.

To calculate the 10-year risk at a myocardial infarction we used the Prospective Cardiovascular Münster (PROCAM) score, a risk score algorithm containing most traditional risk factors, age, smoking, family history (myocardial infarction < 60 years), diabetes, LDL, HDL and triglyceride levels and systolic blood pressure. These risk factors all have their weighing factors calculated by a cox proportional hazards model using a cohort of 5389 participants collected from 1979 to 1985 with a follow-up of 10 years, 325 major coronary events occurred.3

**Mass Intervention via Internet.** Starting 2 weeks after the health fair, all participants received their PROCAM scores and related health advice through e-mails. Participants with a low PROCAM risk score (0-5%) were advised to continue a healthy lifestyle and to repeat cardiovascular risk assessment in 5 years. Participants with an intermediate risk score (5-20%) were advised ways to improve risk factor profile and follow-up risk score assessment within one year. Participants with a high-risk score (>20%) were advised to either visit their general practitioner or the Maastricht University Hospital for further assessment. For intervention in lifestyle, personally relevant feedback on participants’ outcomes of the health fair tests and on their lifestyle behaviors was followed by monthly newsletters containing lifestyle, both of which were sent by e-mail to all participants during a 3-month period. The lifestyle advice consisted of recommendations as to exercise, healthy diet, smoking cessation and allowable alcohol consumption. In addition, all participants were invited to join either running or Nordic walking clinics on a weekly basis.

**Results**

Of the 1000 HAPPY volunteers, 900 attended the cardiovascular health fair in March 2007. From the 900 participants, 595 (mean age, 51 years, 295 males, 300 females) took part in the 3-month program and joined the second cardiovascular health fair in June 2007. The risk factor profile included 14.7% smokers, 6.8% diabetics, and 15.9% on antihypertensive drugs. In addition,
26.2% had a family positive family history, and 26.4% indulged in exercise > 4/week. Of 595 patients, only 31 took part in one of the exercise programs. Those who failed to follow up after the first health fair were significantly younger and were more likely to be non-smokers; no other differences between participants and drop-outs were found.

Effect on blood pressure. Of 595 participants, 50% had elevated BP (systolic >140 and/or diastolic >90) at the first health fair. At the second health fair in June 2007, this number had decreased to 30%. Mean systolic BP decreased from 139 mmHg in to 131 mmHg (p<.0001). Mean diastolic pressure decreased from 82 mmHg to 78 mmHg (p<.0001). In addition, 76% of participants on blood pressure lowering medication had elevated BP, which lowered to 54% at follow-up. Of those not taking BP lowering medication, a surprisingly high number, 46% had elevated BP and this decreased to 26% after the intervention.

**Effect on lipid profile.** Total cholesterol levels decreased from a baseline value of 215 mg/dl at baseline to 206 mg/dl (p< .0001) after the internet intervention. LDL-C decreased from 140 mg/dl to 136 mg/dl (p = .001); triglyceride levels decreased from 98 mg/dl to 89 mg/dl (p=.001). Surprisingly, HDL levels also decreased from 55 mg/dl to 50 mg/dl (p<.0001).

**Effect on weight.** Mean weight of the participants was 77.4 kg at baseline and decreased to 76.1 kg (p< .0001) upon follow up. Total loss of weight was 809 kg. Mean body mass index decreased from 26 at baseline to 25.5 (kg/m²) (p< .0001) on follow up.

**Table 1:** Results of mass intervention.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Follow up</th>
<th>(p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean systolic BP (mmHg)</td>
<td>138.6</td>
<td>130.9</td>
<td>.000</td>
</tr>
<tr>
<td>Mean diastolic BP (mmHg)</td>
<td>81.5</td>
<td>77.9</td>
<td>.000</td>
</tr>
<tr>
<td>% elevated BP</td>
<td>50.4</td>
<td>30.8</td>
<td>.000</td>
</tr>
<tr>
<td>Total Cholesterol (mg/dl)</td>
<td>215</td>
<td>206</td>
<td>.000</td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>140</td>
<td>136</td>
<td>.001</td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>55</td>
<td>50</td>
<td>.000</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>98</td>
<td>89</td>
<td>.001</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>101</td>
<td>99</td>
<td>.000</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>77.4</td>
<td>76.1</td>
<td>.000</td>
</tr>
<tr>
<td>Mean PROCAM</td>
<td>6.3</td>
<td>5.5</td>
<td>.000</td>
</tr>
<tr>
<td>% low risk (0-5%)</td>
<td>65.5</td>
<td>67.2</td>
<td>.141</td>
</tr>
<tr>
<td>% intermediate risk (5-20%)</td>
<td>26.6</td>
<td>25.7</td>
<td>.596</td>
</tr>
<tr>
<td>% high risk (&gt;20%)</td>
<td>7.9</td>
<td>6.2</td>
<td>.077</td>
</tr>
</tbody>
</table>
Effect on PROCAM risk score. During the first cardiovascular health fair in March 2007, mean PROCAM risk score was 6.3%. At baseline, 66% had a low, 26% intermediate, and 8% had a high PROCAM risk score. At 3-month follow up, the mean PROCAM risk score had decreased to 5.5% (p=.000). In addition, the numbers of participants with high PROCAM risk score decreased to 6%. No statistically significant relationship was observed between the level of participation in the exercise program and the decrease in PROCAM risk score.

Results after 10-year: 167 participants responded to an e-mailed questionnaire after 10 years. We asked whether the respondents suffered from a myocardial infarction the last 10 year after the health fair.

We categorized the respondents according to their program risk score in mild, intermediate and severe cardiovascular risk group (respectively 0-5%, 5-20%, >20% procam risk score). In table 2 is shown that in the mild group of respondents (0-5% procam risk score), 2.8% of the respondents had suffered myocardial infarction. In the intermediate group (5-20% procam risk score), 11.4% of the respondents suffered myocardial infarction and the severe cardiovascular risk group (>20%), 13.3% had suffered from myocardial infarction 10 years after initial procam risk score calculations. The calculated procam 10-year risk at myocardial infarction, corresponded with the reported myocardial infarctions 10 years later.

Table 2: results after 10 year follow-up

<table>
<thead>
<tr>
<th>Procam group</th>
<th>N</th>
<th>Myocardial Infarction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5%</td>
<td>108</td>
<td>3</td>
<td>2.8%</td>
</tr>
<tr>
<td>5-20%</td>
<td>44</td>
<td>5</td>
<td>11.4%</td>
</tr>
<tr>
<td>&gt;20%</td>
<td>15</td>
<td>2</td>
<td>13.3%</td>
</tr>
<tr>
<td>Overall 6.7%</td>
<td>167</td>
<td>10</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

Discussion

The trial presented here shows that cardiovascular risk screening of large numbers of participants is feasible, and that personalized mass communication via the internet is effective in decreasing the 10-year risk of myocardial infarction as assessed by the PROCAM risk score. The rate of participants who reported to have read the information that was send via e-mail was 98.2%, indicating that participants are amenable to the design of mass communication messages if presented appropriately. Although the data
are encouraging, several questions remain to be addressed. First, our study was not randomized and the independent efficacy of the mass communications cannot be proved. Second, it is unknown whether the positive effects of mass communication will be sustainable beyond a 3-month period using mass communication. Although, app-based notifications have been effective and are promising as a long-term health coaching tool. And lifestyle interventions are sustainable when coaching is adequate, tailored to precisely identify lifestyle issues. Third, it remains to be seen whether such a program would be applicable in other countries. Lack of education and computer facilities in developing countries would limit the effectiveness of such program from where the major proportion of cardiovascular diseases will be emanating in future. Fourth, during 10-year follow-up the mortality data of the participants is lacking. This can cause a lost to follow-up bias. Fifth, the risk score used in this study, the Procam score, is found less accurate in predicting cardiovascular events in comparison to the Framingham risk score and the SCORE score. Regardless of the limitations, it seems that modification of risk factors by mass communication and internet-based education should be given a chance for the quest against cardiovascular scourge.
References


